What is claimed is:

1. A linear actuator comprising

a core having a longitudinal axis;

a coil shaped for movement along the longitudinal axis of the core; and

a magnet structure positioned along the longitudinal axis of the core;

wherein the core includes first and second portions, each including an end face and a cavity having an axis of symmetry along the longitudinal axis of the core, and further wherein the first and second portions are positioned so that the end faces oppose each other and are separated by a gap.

2. The linear actuator of claim 1, further including a housing supported by core flanges and positioned about the coil and the core.

3. The linear actuator of claim 1, wherein the magnet assembly includes magnets of the same polarity facing the coil.

4. The linear actuator of claim 3, wherein the magnets are shaped to be positioned inside of the coil,

5. The linear actuator of claim 3, wherein the magnets are shaped to be positioned outside of the coil.

6. The linear actuator of claim 4, wherein the magnets are supported by the core.

7. The linear actuator of claim 5, further including a housing supported by core flanges and positioned about the coil and the core, and wherein the magnets are supported by the housing.

8. The linear actuator of claim 4, wherein the magnets include a radially magnetized ring magnet.

9. The linear actuator of claim 4, wherein the magnets include a plurality of segmented magnets of the same polarity.

10. The linear actuator of claim 1, wherein the cavity formed in the first portion of the core has a hemispherical cross section along the longitudinal axis.

11. The linear actuator of claim 10, wherein the cavity formed in the second portion of the core has a hemispherical cross section along the longitudinal axis.

12. The linear actuator of claim 1, wherein the cavity formed in the second portion of the core has a curvilinear cross section along the longitudinal axis.

13. The linear actuator of claim 12, wherein the cavity formed in the first portion of the core has a curvilinear cross section along the longitudinal axis.

14. The linear actuator of claim 1, wherein the cavity formed in the first portion of the core has a cross section along the longitudinal axis which is widest at the end face of the first portion of the core.

15. The linear actuator of claim 14, wherein the cavity formed in the second portion of the core has a cross section along the longitudinal axis which is widest at the end face of the second portion of the core.

16. The linear actuator of claim 1, wherein the cavity formed in each of the first and second portions of the core has a cross section along the longitudinal axis which is widest at the end face of the first portion of the core.

17. The linear actuator of claim 16, wherein the cavity formed in each of the first and second portions of the core has a hemispherical cross section along the longitudinal axis.

18. The linear actuator of claim 16, wherein the cavity formed in each of the first and second portions of the core has a curvilinear cross section along the longitudinal axis.

19. The linear actuator of claim 16, wherein the cavity formed in each of the first and second portions of the core has a cross section along the longitudinal axis which is widest toward the end face, and which progressively narrows along the longitudinal axis away from the end face.

20. The linear actuator of claim 16, wherein the cavity in each of the first and second portions of the core along the longitudinal axis is formed by removing circular regions of material of selected depths and selected diameters which are coaxial with the longitudinal axis, and further wherein the selected diameters of the circular regions decrease in a direction away from the end face.

21. The linear actuator of claim 16, wherein the cavity in each of the first and second portions of the core along the longitudinal axis is formed by drilling out regions of material of selected depths and selected diameters which are coaxial with the longitudinal axis, and further wherein the selected diameters of the drilled out regions increase in a direction toward the end face.

22. The linear actuator of claim 2, wherein the core, coil, housing and magnet structure are square in shape transverse to the longitudinal axis.

23. The linear actuator of claim 22 where the core comprises first and second portions each having a face, and a cavity is formed in each face having an axis of symmetry about the longitudinal axis.

24. The linear actuator of claim 23, wherein the cavity in each face is formed from a plurality of square cavities of increasing cross-section beginning at a selected distance from the face.

25. The linear actuator of claim 2, wherein the core, coil, housing and magnets are cylindrical in shape in a direction perpendicular to the longitudinal

axis, and the cavity formed in each face of the first and second portions of the core is half-spherical.

26. The linear actuator of claim 3, wherein the gap is formed in a plane transverse to the longitudinal axis, and the magnets are positioned to form a space between them which is aligned with the plane transverse to the longitudinal axis.

27. A method for constructing a linear actuator comprising the steps of

forming a core having a first portion and a second portion positioned along a longitudinal axis;

defining an end face in each of the first and second portions;

forming a cavity having an axis of symmetry along the longitudinal axis of the core in each of the first and second portions; and

positioning the first and second portions so that the end faces oppose each other and are separated by a gap;

shaping a coil for movement along the longitudinal axis of the core; and

positioning a magnet structure along the longitudinal axis of the core.

28. The method of claim 27, wherein the cavity forming step includes the step of shaping the cavity to have a half-spherical cross section.

29. The method of claim 27, wherein the cavity forming step includes the step of shaping the cavity to have a curvilinear cross section.

30. The method of claim 27, wherein the cavity forming step includes the step of shaping the cavity to have a cross section along the longitudinal axis which is widest at the end faces of the first and second portions of the core.

31. The method of claim 27, wherein the cavity forming step includes the step of removing circular regions of material of selected depths and selected diameters which are coaxial with the longitudinal axis, causing the selected

diameters of the circular regions to decrease in a direction away from the end face.

32. The method of claim 27, wherein the cavity forming step includes the step of drilling out regions of material of selected depths and selected diameters which are coaxial with the longitudinal axis, and causing the selected diameters of the drilled out regions to increase in a direction toward the end face.

33. The method of claim 27, wherein the first and second portion positioning step includes the step of forming the gap in a plane transverse to the longitudinal axis, and further wherein the magnet structure positioning step includes the step of

positioning a plurality of magnets to form a space between them which is aligned with the plane transverse to the longitudinal axis.

34. A linear actuator comprising

a core;

a coil shaped to be positioned about the core for movement along a longitudinal axis of the core;

a magnet assembly including magnets of the same polarity facing the coil; and

a housing supported by core flanges and positioned about the coil and the core; and

wherein the core includes first and second portions, each having an end face, and the first and second portions are positioned along the longitudinal axis so that the end faces oppose each other and are separated by a gap, and further wherein a cavity is symmetrically formed in each of the end faces along the longitudinal axis.

35. The linear actuator of claim 34, wherein the magnets are shaped to be positioned inside of the coil, and to be supported by the core.

36. The linear actuator of claim 34, wherein the magnets are shaped to be positioned outside of the coil, and to be supported by the housing.

38. The linear actuator of claim 34, wherein the cavity formed in each face of the first and second portions of the core has a half-spherical cross section relative to the longitudinal axis.

39. The linear actuator of claim 34, wherein the cavity in each face of the first and second portions of the core is created by forming concentric bores of varying diameters in the end faces of the first and second portions of the core having centers along the longitudinal axis.

40. A method for constructing a linear actuator comprising the steps of

forming a core having a first portion and a second portion positioned along a longitudinal axis;

defining an end face in each of the first and second portions;

removing material symmetrically along the longitudinal axis of the core to form a cavity in each of the first and second portions; and

positioning the first and second portions so that the end faces oppose each other and are separated by a gap;

shaping a coil for movement along the longitudinal axis of the core; and

positioning a magnet structure along the longitudinal axis of the core.